New airport liquid analysis system undergoes testing at Albuquerque International Sunport

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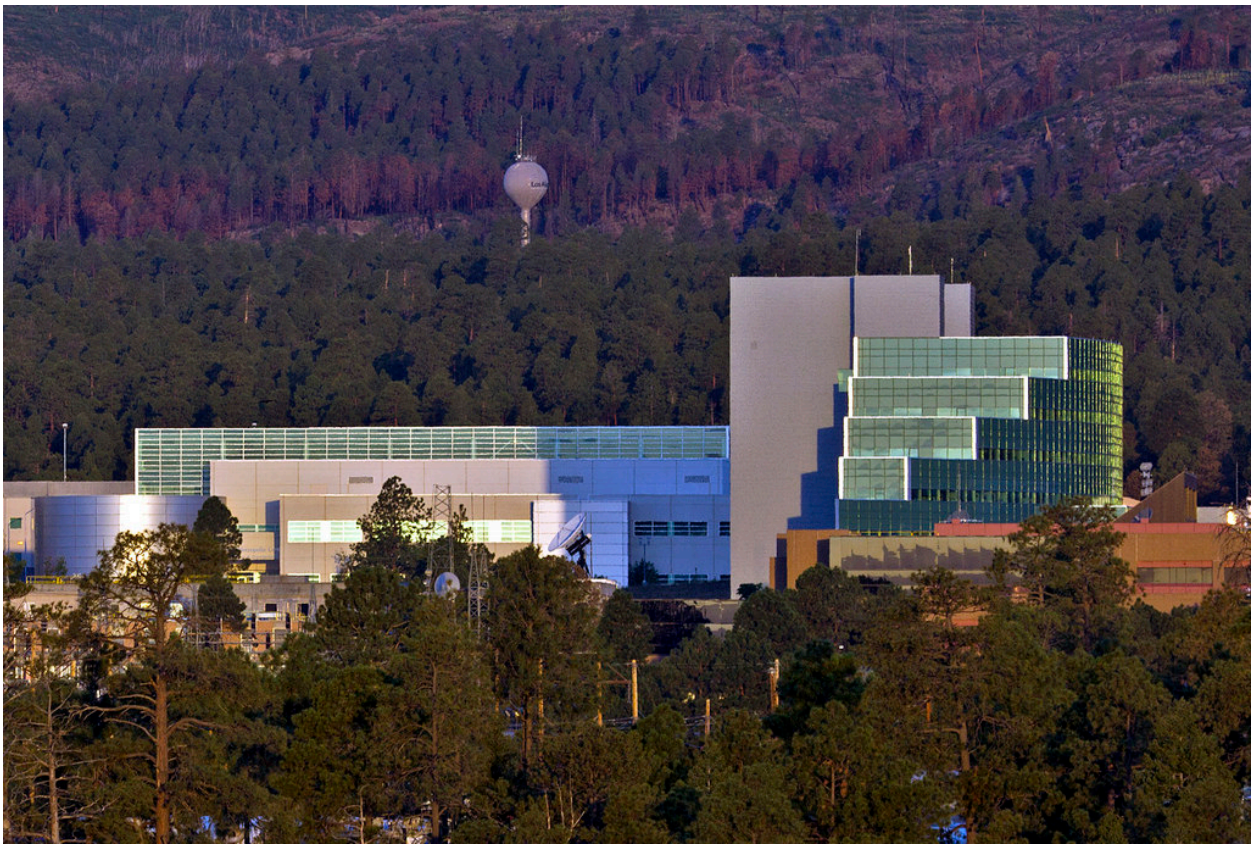

MagViz technology from Los Alamos sorts out liquids and gels

LOS ALAMOS, New Mexico, December 16, 2008—An innovative application of a technology first used for medical imaging may enhance airport security if Los Alamos National Laboratory scientists are successful. Los Alamos technologists have adapted Magnetic Resonance Imaging (MRI) technology from the familiar medical device to create MagViz, a new tool that distinguishes potential-threat liquids from the harmless shampoos and sodas a regular traveler might take aboard an aircraft.

Funded by the U.S. Department of Homeland Security, the MagViz system is a new, ultra-low-field MRI approach first designed for brain imaging, but with a unique variation.

Given a container of something that shouldn't be on board an airplane, the MagViz system highlights the image in red for the security screening staffer to examine further. A prototype MagViz machine was unveiled today at the Albuquerque International Sunport, where it is undergoing field testing. Should the development process continue successfully, machines could be in airports by 2012.

In an MRI machine, magnetic fields cause hydrogen atoms to line up and spin in a substanc—a bottle of water, a patient's brain, an injured knee—placed within its field. Eventually the atoms begin to wobble, falling out of rhythm. This wobbling of hydrogen atoms occurs in unique patterns for different chemicals. And sensors in the MRI machine detect these slightly different frequencies, which are in effect chemical fingerprints that can tip off technicians to the presence of distinct substances when translated to an image. In a hospital MRI, for example, the subtleties in the chemical composition of a tumor compared with that of healthy brain tissue result in a contrasting image.

The fainter signals that MagViz teases out with a weaker magnet challenged the Los Alamos team to make sense of the less-distinct images. To increase the strength of the signal, the team incorporated a prepolarization field 100 times stronger than the magnet used to measure the spin. And the technology relies on sophisticated detectors called superconducting quantum interference devices, or SQUIDs. Whereas a hospital MRI detects spin with a sensor akin to a radio antenna, tuned to a specific set of frequencies, SQUIDs can pick up the oscillation of hydrogen or other atoms at any frequency.

Linked with a computer database, MagViz can now reliably identify some 50 liquids from their chemical fingerprints. And that's only the beginning. "That's one of the beauties of this technology," project leader Michelle Espy said. "We can add different threats as we become aware of them."

If MagViz finds a chemical designated as a threat, the machine will mark the container with a red dot on the screen. Harmless substances get a green dot, and if the machine can't identify the liquid, a yellow dot appears, indicating that further inspection is needed. As new threats emerge, "we just put them in the database and set the gate," Espy said. Like the sensitivity setting in a metal detector, that "gate" is an adjustable security threshold.

The Homeland Security Advanced Research Project Agency (HSARPA) at the U.S. Department of Homeland Security Science & Technology Directorate, which is supporting this project with a $5 million grant, hopes the final version will be able to scan bags at a speed similar to the current security checkpoint X-ray machines.